

# Innovation Policy for Climate Change

A REPORT TO THE NATION

## Summary

**The world** is not on a path to reduced greenhouse gas emissions. The suite of commercially viable climate-friendly energy technology needs to be expanded rapidly, which in turn requires appropriate government policies. The current high cost of delivering low-carbon energy means that energy-climate technologies must be treated by governments as a public good, akin to national defense, public health and disaster protection. Doing so can open up new avenues for energy-climate technology policy such as those that allowed the U.S. to lead the world in innovation for much of the 20th century.

This report draws on the lessons of past U.S. government policy for technological innovation, as well as three workshops held in March and April of 2009. The workshops brought experts on innovation and government policy together with experts in three technologies—solar photovoltaics (PVs), post-combustion capture of carbon dioxide (CO<sub>2</sub>) from power plants, and direct removal of CO<sub>2</sub> from the atmosphere (air capture)—not in search of consensus, but to probe and illustrate the complexities and opportunities of energy-climate innovation policy.\*

The report concludes that:

- **To improve government performance, and expand innovation options and pathways, Congress and the administration must foster competition within government.** Competition breeds innovation. That is true in economic markets and it holds for government too. The United States relies far too heavily on the Department of Energy (DOE) for pursuing energy innovation. Competitive forces drove military technological innovation after World War II—East-West competition; competition among defense, aerospace, and electronics firms; and competition among the military services. Inter-agency competition has been an effective force in innovation across such diverse technologies as genome mapping and satellites. No such competitive forces exist for energy-climate technologies. Expertise and experience exist today in many parts of the public sector other than DOE, including the Department of Defense (DoD), the Environmental Protection Agency (EPA), and state and local governments. And facing meaningful competition, DOE would have to improve its own performance or risk losing resources.
- **To advance greenhouse-gas-reducing technologies that lack a market rationale, government should selectively pursue energy-climate innovation using a public works model.** There is no customer for innovations such as post-combustion capture of powerplant CO<sub>2</sub> and air capture. (Indeed, no more than about two dozen people worldwide appear to be working on air capture at all – an unacceptably small number by any standard.) Recognition of greenhouse gas (GHG) reduction as a public good redefines government as a customer, just as it is for, say, pandemic

flu vaccines, flood control dams, or aircraft carriers. This perspective points to new approaches for creating energy-climate infrastructure in support of innovation and GHG management. Some tasks might be delegated to state and local authorities, which already collect trash, maintain water and sewer systems, and attempt to safeguard urban air quality.

- **To stimulate commercialization, policy makers must recognize the crucial role of demonstration projects in energy-climate innovation, especially for technologies with potential applications in the electric utility industry.** Government-sponsored demonstration programs have a long-established place in U.S. technology and innovation policy, but a poor reputation in energy. Since the primary purpose of demonstrations is to reduce technical and cost uncertainties, the private sector should be chiefly responsible for managing demonstrations, with government providing financial support, disseminating results openly, and ensuring a level competitive playing field. Well-planned and conducted programs could push forward technologies such as CO<sub>2</sub> capture from power plants. While, for example, the DOE has supported exploratory R&D on advanced coal-burning power generation for several decades, it has largely ignored the issues raised by controlling CO<sub>2</sub> from the nation's existing coal-fired power plants, which produce over one-third of U.S. CO<sub>2</sub> emissions. Technologies exist for capturing CO<sub>2</sub> from such plants, but they have not been tested at full plant scale.
- **To catalyze and accelerate innovation, government should become a major consumer of innovative energy technology products and systems.** DoD procurement has been an enormously powerful influence on innovation across important areas of advanced technology from electronics to aerospace to info-tech. In contrast, the U.S. government has not systematically and strategically used its purchasing power to foster energy-related innovations. Yet each year, federal, state, and local governments spend large sums on goods and services with implications for GHG release and climate change, including office buildings, motor vehicles, and transit systems. Government can be a “smarter customer” for energy-climate innovations, helping to create early markets, driving competition among firms, and fostering confidence in advanced technologies, including those that are not yet price-competitive in the open market.

Like other aspects of U.S. energy and climate policy, the nation's approach to energy-climate innovation has lacked a clear mission and strategy. Most attention and discussion has focused on advanced research, yet most innovation in the coming decades will depend much less on frontier research than on other available and proven tools. (Indeed, in none of our workshops did “more research” surface as the major concern—not even for air capture, which, though radical in concept, is based on well-understood concepts and processes.) We know what works, based on the past 60 years and more of experience, but so far we have not used what we know to address energy technologies and climate change. We know, for example, that technological advances come largely from industry—but that government can catalyze, and even create, new waves of industrial innovation by supporting the technology base, providing incentives (such as those that have been so effective in expanding the market for PV systems), and deploying its purchasing power. By treating climate mitigation as a public good and GHG reduction as a public works endeavor, the United States can rapidly strengthen the linkages between public investment and private sector innovation, and begin to lead other countries toward building energy-climate technologies into the fabric of their innovation systems, their economies, and their societies.

\* While this report draws from the workshops, it does not represent the views, individual or collective, of workshop participants; nor does it represent the views of the project's sponsors, the Bipartisan Policy Center's National Commission on Energy Policy, or the workshops' facilitator, The Keystone Center.